

# NASA TECH BRIEF

## Langley Research Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

### Long-Life Electromechanical Sine-Cosine Generator

#### The problem:

To develop a sine-cosine generator capable of withstanding a 20 Hz oscillation for more than 14 hours. A sine-cosine potentiometer was used in a transonic dynamics tunnel to generate the references

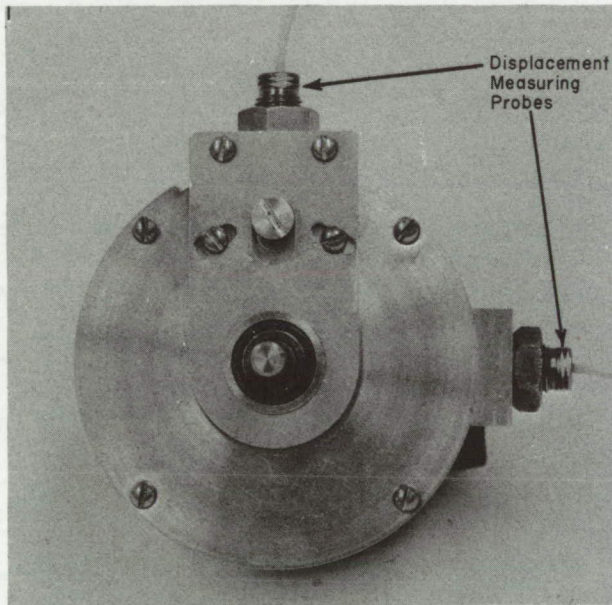


Figure 1.

used during frequency response analysis tests of models flown in an oscillation airstream. At an oscillation of 20 Hz, the potentiometer lasted only about 14 hours, and replacement took six hours.

#### The solution:

A sine-cosine generator with no sliding components.

#### How it's done:

Sine-cosine signals with a maximum error of less than one percent are generated by a system employ-

ing nonconducting displacement measuring probes to sense distance from an off-center rotating cylinder.

Figure 1 shows the sine-cosine generator; figure 2 shows a cross-sectional view of the generator; and figure 3 is a block diagram of the system.

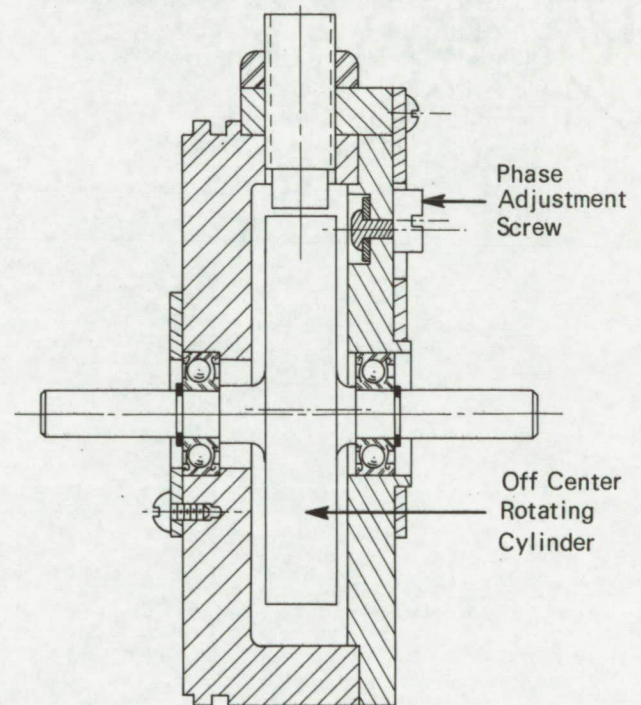


Figure 2.

The 0.013 cm (0.005 in.) offset between the center of the cylinder and its center of rotation is small enough to offer good linear response from the displacement probe, yet large enough to mask irregularities in the bearings. The displacement probes are mounted 1.57 rad (90 deg) apart; a phase adjustment screw allows exact angular placement.

(continued overleaf)

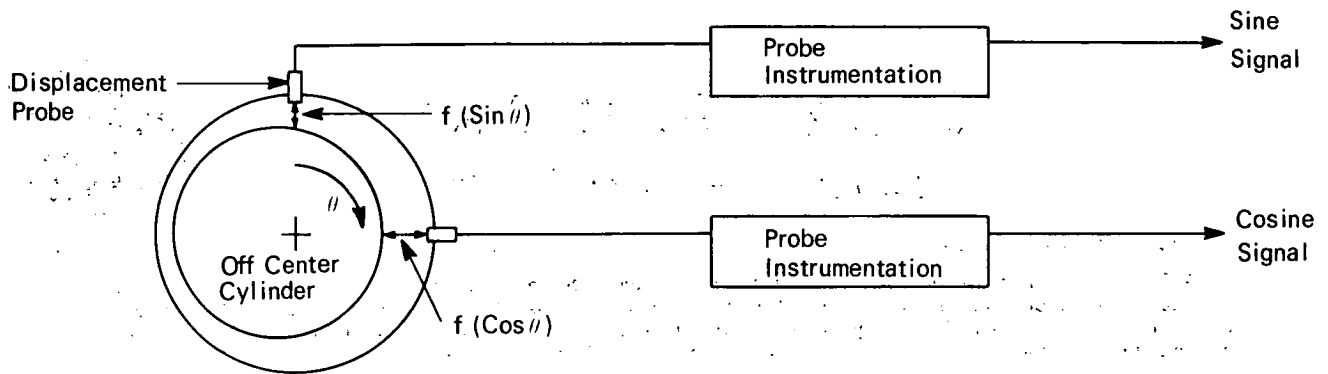


Figure 3:

Tests have demonstrated that the generator is electrically equal to the potentiometer and that it has excellent dynamic characteristics. Because there are no sliding parts, this new sine-cosine generator shows promise of higher-speed applications than was previously possible.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
Langley Research Center  
Hampton, Virginia 23365  
Reference: TSP71-10029

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel  
Mail Code 173  
Langley Research Center  
Langley Station  
Hampton, Virginia 23365

Source: Bruce Flagge  
Langley Research Center  
(LAR-10503)